REMARKS

Applicants appreciate the thorough examination of the application that is reflected in the Office Action dated February 21, 2003. Claims 51-53 and 113-127 have been amended to correct typographical errors. Applicants submit that the independent claims distinguish over the cited references for at least the reasons discussed in the previous response and also for additional reasons discussed below. Reexamination and reconsideration of the application are respectfully requested.

Independent Claims 37, 56, 62, 63 and 113

Claims 37-53, 56, and 62-67 were rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,725,407 to Liu et al. (hereinafter Liu) in view of USPN 5,965,281 to Cao (hereinafter Cao) and Jonas '515 and further in view of USPN 5,667,572 to Taniguchi et al. (hereinafter Taniguchi). To the extent the same grounds of rejection are applied to the amended claims, Applicants respectfully traverse these rejections for at least the following reasons.

Amended claims 37 relates to a manufacturing process for an organic EL element having a stacked structure including a hole injecting and transporting layer and a light-emitting layer formed within a partitioning member which is divided into individual pixel areas. The method comprises:

> forming an anode layer;
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> forming the partitioning member above a substrate, the partitioning member having openings over at least a portion of the anode layer, the openings corresponding to pixel areas;
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> forming a hole injecting and transporting layer by independently filling each of the openings with a composition for the hole injecting and transporting layer using an ink-jet head, the composition comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent;
>
> drying the composition filled in the openings to form the hole injecting and transporting layer; and
>
> independently filling each of the openings with a light-emitting layer composition using an ink-jet head to form the light-emitting layer;
>
> forming a cathode layer over the light-emitting layer. (Emphasis added.)

Applicants respectfully traverse the rejection of claim 37 for at least the following reasons.

1. The cited references fail to teach or suggest every limitation of the claims, such as, "independently filling each of the openings with a composition for the hole injecting and transporting layer using an ink-jet head,.."

Applicants respectfully submit that all of the cited references fail to teach or suggest, for example, "forming a hole injecting and transporting layer by **independently** filling each of the openings with a composition for the hole injecting and transporting layer **using an ink-jet head**, the composition comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent," as recited in claim 37.

In the response to the Applicants' arguments presented in the responses filed on May 30, 2002 and June 27, 2002, Applicants note that the Examiner has failed to show that the references teach both (1) the claimed anode layer and (2) the claimed hole injecting a transport layer that is distinct from the anode layer. At page 2, lines 7-9, Applicants discuss the general structure of a two-layer type structure element and notes that "a hole injecting and transport layer ... situated between the anode and the light-emitting layer." As such, the anode is distinguishable from the "hole injecting and transport layer." Claim 37 reflects the distinction between these two layers. The Examiner's conclusion that because an anode layer injects and transports holes that it satisfies both the anode layer and the hole-injecting and transporting layer is without merit. In order to establish a rejection under 35 U.S.C. 103, it is necessary that the Examiner show that each of the limitations of the claim is present in the prior art. The Examiner has not satisfied this burden. Accordingly, Applicants respectfully request that the Examiner specifically point out which reference teaches the anode layer.

a. The Jonas '515 reference

At page 4 of the Office Action the Examiner notes that "'515 teaches that a polythiophene films suitable for deposition as electrodes in EL devices (col. 3, lines 5-67) are formed using compositions including PEDT and PSS and a solvent."

However, the Jonas '515 reference does not teach independently filling each of the openings with the claimed composition or using an ink-jet head to do so. In fact, as noted at col. 3, lines 31-34, the Jonas '515 reference also fails to teach or suggest using "polythiophene dispersions" to form a "hole injecting and transporting layer", as claimed, but instead "relates to electroluminescent systems which contain polythiophene dispersions according to the invention

in the form of a transparent conductive layer or electrode." At col. 4, lines 28-33, Jonas '515 then goes on to note that "One or more intermediate layers can be additionally arranged between the electroluminescent systems and the electrodes. The intermediate layers – charge-carrier transporting substances—are known (for example from Appl. Phys. Lett. 57 (1990)531) and are defined therein as HTL (hole transport layer) and ETL (electron transport layer)."

Accordingly, Jonas '515 is silent with respect to filling any openings with either a hole injecting and transporting layer or a light emitting layer composition, not to mention "forming a hole injecting and transporting layer by **independently** filling each of the openings with a composition for the hole injecting and transporting layer **using an ink-jet head**, the composition comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent," as recited in claim 37.

b. The Cao reference

The Cao reference also does not teach or suggest independently filling each of the openings with the claimed composition or using an ink-jet head to do so, as claimed. It appears that the Examiner is citing the Cao reference as teaching organic EL elements having a cathode layer and a bi-layer anode comprising ITO overcoated with a layer of PEDT doped with PSS. For example, the Examiner cites Cao as disclosing "that polythiophene may be used as the anode instead of ITO (co. 10, lines 16-37)." Applicants note, however, that the independent claims do not disclose any specific material for the anode layer.[1] In addition, in the independent claims, the anode material is not deposited in the openings. Rather, it is below the partitioning members. Thus, it appears that the Examiner failed to distinguish between the anode layer and the "hole injecting and transporting layer." Applicants submit that the disclosure of an ITO/PEDT/PSS bi-layer anode is of no relevance to the claimed "hole injecting and transporting layer."

c. The Jonas '483 reference

Jonas '483 merely discloses scratch resistant conductive coatings, and fails to mention the use of such coatings in ink-jet printing applications or in the construction of electroluminescent elements. Jonas '483 mentions that mixtures taught therein may be applied by gravure printing, flexographic printing, screen printing, or by knife application, roll application, [or] curtain coating. Significantly, Jones '483 fails to disclose ink-jet printing.

[1] The specification mentions that anode 101 may be an ITO transparent electrode.

Moreover, each of these techniques are far different than ink-jet printing and do not encounter the problems associated with ink-jet printing. Jonas '483 also fails to teach "a hole injecting and transporting layer," not to mention using the claimed composition.

d. The Liu reference

The Examiner cites Liu as teaching the steps of forming partitioning members on a substrate having openings corresponding to pixels on a substrate and filing the openings with an anode material. The Examiner also takes the position that the method of the Liu et al. reference indicates that the anode layer is deposited uniformly over the partition walls and then selectively removed from the tops of the partitions in order to isolate the electrodes within each opening.

Applicants note, however, that according to claims 37, 56, 62, 63 and 113, the openings are not filled with an anode material, and moreover that in each of the independent claims "an anode layer" is distinguishable from the "hole injecting and transporting layer." The Liu et al. reference teaches the use of inorganic phosphors to form an EL device. However, the Liu et al. reference is silent with respect to organic EL elements, as well as EL elements having a stacked structure that includes a hole injecting and transporting layer and a light emitting layer formed within a partitioning member which is divided into individual pixel areas." The Liu et al. reference also fails to discuss an anode layer that is formed below the partitioning members or the characteristics of the composition used to form the hole injecting and transporting layer. In addition, there is no disclosure of an ink-jet head.

Thus, none of the cited references teach or suggest, for example, "forming a hole injecting and transporting layer by **independently filling** each of the openings with a composition ... comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent," as recited in claim 37. In addition, Applicants note that the cited references fail to teach or suggest the concept of "independently filling each of the openings as required by claim 37, let alone the concept of doing so in a manufacturing process for an organic EL element having a stacked structure ... using an ink jet head, as required by claim 37.

Accordingly, the rejection of claim 37 and the claims 38-49, 51, 53 and 54 that depend therefrom should be withdrawn. Applicants further respectfully submit that independent claims 56, 62, 63 and 113, and the claims 68-128 that depend therefrom, are also patentable over the cited references for at least the same reasons.

2. The step of "forming a hole injecting and transporting layer by independently filling each of the openings with a composition for the hole injecting and transporting layer using an ink-jet head, the composition comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent," is not well-known in the art since prior to the Applicants no one had attempted to use an ink-jet head to form a hole injecting and transporting layer by filling each of the openings with a composition, and using the claimed composition with an ink-jet head produces unexpected results.

As established above, the cited references fail to teach or suggest the use of an ink-jet head, not to mention the use of an ink-jet head to independently fill openings corresponding to pixel areas. The Examiner also takes the position that ink-jet printing is a well-known method of supplying material to selective locations.

Applicants respectfully disagree, and submit that ink-jet printing is not well-known **in the context of manufacturing EL elements** and is certainly not well-known for independently filling each of the openings with either a composition for a hole injecting and transporting layer or a composition for a light emitting layer. Rather, the use of the claimed composition in conjunction with an ink-jet head produces **unexpected results** since prior to the Applicants, no one had used an ink-jet head to fill each of the openings with the claimed composition. Therefore, the results of this step could not be expected.

Evidence of these unexpected results is discussed throughout the present Application, for example, at page 4, line 7 through page 11, line 16 and pages 33-34. In contrast to any of the references, the claimed composition is used in forming a hole injecting and transporting layer of an organic EL element. The claimed composition is particularly useful with an ink-jet head since the composition has physical properties that allow the composition to be used with an ink-jet head, and allow high precision pattern film formation to be carried out easily, in a short time, and at low cost. For example, these physical properties make it possible to produce a longer flushing time and to maintain a more fresh state at the interface of the composition for a hole injecting and transporting layer with the air. See page 9, lines 16-18. Moreover, the composition allows uniform dot density for the composition of the hole injecting and transporting layer being

discharged, thereby making it possible to prevent irregularities. See page 9, lines 18-23. Film thickness, number of dots and other parameters can be adjusted in a desired manner, allowing the size and patterning of the light-emitting element to be adjusted as desired. See page 33, line 21 – page 34, line 1. Further, since the linearity of flight is excellent, control of the ink-jet head is facilitated. See page 9, lines 24-25. The inclusion of a lubricant can effectively prevent drying and solidification of the ink composition in a nozzle mouth. By including lubricant, the resultant composition also has superior discharge properties. See page 19, lines 7-14. The film forming properties of the hole injecting and transporting layer affect the light emission characteristics of the resulting electroluminescent element.

Thus, "forming a hole injecting and transporting layer by independently filling each of the openings with a composition for the hole injecting and transporting layer using an ink-jet head, the composition comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent," clearly produces results that would not have been expected. Accordingly, the rejection of each of the independent claims should be withdrawn.

The Examiner's assertion at page 6, paragraph 8, subparagraph 5 of the Office Action that "the Examiner has given official notice that ink-jet printing is a notoriously well know printing method ...Applicant has not timely challenged the official notice, and therefore has conceded that point," is without merit for at least the reasons stated above, and also because Applicant has repeatedly traversed this ground of rejection, for example, in the responses filed on May 28, 2002 at page 6, last paragraph, first two lines and December 19, 2002 at page 15, last paragraph and at page 17, third full paragraph. In the event the Examiner seeks to maintain this ground of rejection, then Applicants respectfully request that Examiner Cleveland cite a reference that teach "forming a hole injecting and transporting layer by **independently filling** each of the openings with a composition ... using an ink-jet head, the composition comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent," in support of his well-known assertion. Otherwise the rejection should be withdrawn.

3. Absent impermissible hindsight reasoning there is no motivation to combine the cited references.

Moreover, Applicants also submit that the Official Action has not demonstrated a motivation to combine the cited references, but instead has impermissibly reconstructed the prior art based on hindsight gleaned from the present application.

In explaining why there is a motivation to combine the Jonas '515 patent and the Cao patent and the Liu et al. patent, the Final Official Action simply concludes that:

> "Although ink-jet-printing is not explicitly disclosed, ink-jet printing is a notoriously well-known printing method. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used ink-jet printing to have deposited the polythiophene film in the EL device suggested by '407 and '281 with a reasonable expectation of success. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made that such a method would have simplified the process."

However, the Final Official Action makes these statements without giving any specific reasons, from the references themselves, as to why the desire simplify "the process" would necessarily impel one skilled in the art to do what the Applicants have suggested (i.e., independently filling each of the openings ...using an ink-jet head).

In addition, Applicants respectfully submit that the Final Official Action fails to point to out any **specific** motivation in either the Jonas '515 patent, the Cao patent or the Liu et al. patent that **suggests the desirability** of modifying either patent. Instead, the Official Action has merely concluded that there is, somewhere, a motivation to combine the Jonas '515 patent, the Cao patent and the Liu et al. patent. The Official Action has not shown clear and **particular** evidence of a suggestion, teaching, or motivation to modify any of the cited references. Moreover, the Official Action has also not shown evidence that clearly and particularly suggests independently filling each of the openings ...using an ink-jet head. Thus, absent clear and particular evidence of a suggestion in either Cao patent, the Liu et al. patent or Jonas '515 recognizing that each of the openings could be independently filled "using an ink-jet head," Applicants respectfully submit that all of the pending claims are non-obvious over the cited art.

Applicants respectfully submit that Jonas '515 does not provide particular evidence as to the reason the skilled artisan would have been motivated to independently fill each of the openings of the partition member using an ink-jet head. Moreover, Jonas '515 does not suggest

that the polythiophene films should be used to form the "hole injecting and transporting layer." Jonas '515 merely discloses that polythiophene films may be used as electrodes in EL devices (*See* Jonas '515 at col. 3, lines 5-67), and does not appear to recognize that polythiophene films could also be used to independently fill openings using a ink-jet head. In fact, the Jonas '515 reference does not even mention that ink-jet heads exist. Although Jonas '515 establishes that polythiophene films are known, Jonas '515 is silent with respect to their use with ink-jet heads or to form organic EL elements having an anode layer, a hole injecting and transporting layer, and a cathode layer.

By contrast, the Liu et al. patent does not provide any motivation for independently filling each of the openings ...using an ink-jet head in the claimed manner. The Liu et al. patent teaches forming partitioning members (2) on a substrate having openings and filling the openings with an anode material. The Liu et al. patent does not teach "forming the partitioning member ... having openings over at least a portion of the anode layer," after "forming an anode layer," as claimed. The primary reference, Liu et al., also appears to be devoid of any discussion regarding the need to independently fill each of the openings ...using an ink-jet head. Moreover, the Liu et al. patent does not teach a composition comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent. In fact, the Liu et al. patent does not even relate to organic devices. Thus, it is unclear why anyone would modify the Liu et al. patent so significantly.

The teachings of the Cao patent also do not suggest that polythiophene films taught in Jonas '515 might be useful in independently filling each of the openings ...using an ink-jet head. In fact, the Cao patent does not recognize that high precision patterning of a hole injecting and transporting layer could be achieved by using an ink-jet head. There is apparently nothing in Cao patent that would suggest use of a an ink-jet head, much less the usefulness of polythiophene films taught in Jonas '515 with such an ink-jet head. Therefore, Cao patent apparently does not provide even the slightest hint as to why the claimed method would be desirable.

It appears that the Official Action has concluded that simply because the technical concepts of polythiophene films and ink-jet printing are known, that "forming a hole injecting and transporting layer by independently filling each of the openings with a composition ... comprising (1) a conductive material containing at least a lubricant, polyethylene

dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent", would be suggested by the Jonas '515 patent, the Cao patent or the Liu et al patent. Even though the Jonas '515 patent establishes that the concept of polythiophene films are **generally known**, this alone does **not** provide motivation to form a hole injecting and transporting layer by independently filling each of the openings with a composition ... comprising (1) a conductive material containing at least a lubricant, polyethylene dioxythiophene, and polystyrene sulfonic acid, and (2) a solvent."

Applicants also respectfully submit that absent hindsight gleaned from Applicants' disclosure, there is no specific motivation provided by Cao patent, the Liu et al. patent or Jonas '515 to combine the Jonas '515 patent with the Cao patent and the Liu et al. patent. Therefore, absent hindsight, there is no motivation for combining Jonas '515 and the Cao patent and the Liu et al. patent.

The concept of "independently filling ... using an ink-jet head" was conceived to solve specific problems. One such problem was that when the hole injecting and transporting layer was formed on an undesired portion, the hole injecting and transporting layer was partially uncovered by the subsequent light-emitting layer. This generates currents that do not pass through light-emitting layer, and the resultant current would not be effective for emission of the light-emitting layer. Another problem is that if the light-emitting layer is formed on an undesired portion of the hole injecting and transporting layer, a pixel area is formed in which the hole is not injected through the underlying hole injecting and transporting layer. Emission intensity depends upon the efficiency of the hole injection. Thus, uneven emission occurs due to coexistence of a portion in which the hole is injected through the hole injecting and transporting layer, and another portion in which the hole is not injected through the hole injecting and transporting layer. However, "independently filling ... using an ink-jet head" enables the hole injecting and transporting layer and the light-emitting layer to be arranged in a stacked manner into a prescribed pixel area. This can reduce or eliminate problems such as generation of ineffective current and uneven emission. None of the cited references relate to these problem or propose solutions thereto.

Applicants respectfully submit that there is no motivation for combining the references under § 103(a), and therefore it was not obvious to combine these references at the time the invention was made. Based on the above, the rejection under section 103(a) should be

withdrawn. Accordingly, Applicants submit that all of the pending claims are patentable over the cited art.

Claims 53, 113-127

The Examiner rejected claims 53 and 113-127 despite admitting that none of the cited references teach or suggest the use of a lubricant, the particular concentrations, contact angles, viscosities and surface tensions of the coating solutions or identifying the particular solvents that are used. The Examiner concludes that the product would be identical regardless of the physical properties or which solvent is used and that the product would be identical without the use of a lubricant in the absence of a showing of unexpected results. For at least the reasons stated above and outlined in the specification, Applicants respectfully submit that the subject matter of these claims does indeed produce results that would not have been expected, and therefore that the Examiner has not established the obviousness of the limitations in claims 53 and claims 113-127.

In the event the Examiner seeks to maintain the rejection based on these grounds, then Applicants respectfully request that the Examiner produce references that teach or suggest the limitations of those claims. Otherwise, the rejection on those grounds is inappropriate and should be withdrawn.

Claims 37-49, 51, 53, 56, 62-81, 83-96, 98-111 and 113-127

Claims 37-49, 51, 53, 56, 62-81, 83-96, 98-111 and 113-127 were rejected under 35 U.S.C. 103(a) as being unpatentable over Liu in view of Cao and Jonas and further in view of Taniguchi.

For at least the reasons noted above, Applicants respectfully submit that all of the pending claims are patentable over the cited references. In addition, with respect to the rejection of claims 38-44, 68-74, 83-89, 98-104, 114-120, 45-47, 75-77, 90-92, 105-107, 121-123, 53-81, 96, 111, 127 and 62-63, Applicants respectfully request that the Examiner produce some documentary evidence establishing that the limitations of those claims would indeed have been obvious. In the absence of such documentary proof, Applicants respectfully request that the rejections on those grounds be withdrawn.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6793 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

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